VASCULAR COMPLICATIONS IN RENAL AND LIVER TRANSPLANTS

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DISCLOSURES

• Cook Medical Inc
  • Expert panel (Embolics)
LIVER TRANSPLANTATION

- 16,000 awaiting. 6,500 OLT/yr
  - ESLD with minimal function & no potential recovery
  - Liver limited cancer
- 75% overall 5yr survival

1998 - 2007

Liver Transplants
VASCULAR COMPLICATIONS OF OLT

- Overall incidence: 9-12%
- Threaten outcomes for Pts and Allografts… Prompt Dx reverses
- Variable presentation
  - Elevation of LFTS
  - Bile leakage
  - Hemorrhage
  - Sepsis

**Vascular complications of orthotopic liver transplantation: experience in more than 4,200 patients.**

Duffy JP, Hong JC, Farmer DG, Ghobrial RM, Yersiz H, Hiatt JR, Busuttil RW.
Department of Surgery, Dumont-UCLA Transplant Center, David Geffen School of Medicine at UCLA, Los Angeles, CA 90095, USA.

Tamsel, Abdom Imag, 2006
HEPATIC ARTERY

- Thrombosis
- Stenosis (5-10%)
- Pseudoanerysm
- Kinking

Resistive Index:
- Normal HA 0.5-0.8
- Increased RI:
  - < 72 hrs HA RI > 0.8 can be normal
  - Older donor age
  - Prolonged Ischemia Time
HEPATIC ARTERY THROMBOSIS

• 4-12% Adults, 40% Peds OLT
• Leading cause graft loss (53%), mortality (33%) in immediate post op period
• P/C:
  • LFTS (75%), Biliary (15%), Sepsis (6%), Graft Failure (4%)
• R/F:
  • Dissection HA
  • Anastomotic stenosis
  • Aberrent donor anatomy
  • Previous TACE
  • 20% all OLT now performed for HCC

Kim, AJR, 2007
Duffy, JACS, 2008
HAT: IMAGING
HA: NON-OCCULSIVE THROMBUS

- 46yr old Female
- HBV cirrhosis
- OLT Sept 20th 2012
HEPATIC ARTERY KINKING
PORTAL VEIN

- Relatively rare (1-2%)
  - Thrombosis
  - Stenosis
- R/F:
  - Vessel caliber mismatch (peds)
  - Previous Thrombosis
  - IVC Stenosis
  - Hypercoagulable state
IVC/HEPATIC VEIN

- Low incidence (<1%)
- M/C: Delayed stenosis at superior caval anastamosis
- Budd-Chiari:
  - “Piggyback”
    - Preservation of recipient IVC and cavocaval anastamosis
    - Increased risk B-C (1.5%)
- Respond well to endovascular therapy
Effect of protocol Doppler ultrasonography and urgent revascularization on early hepatic artery thrombosis after pediatric liver transplantation.


Early arterial revascularization after hepatic artery thrombosis may avoid graft loss and improve outcomes in adult liver transplantation.

HEPATIC ARTERIAL IMAGING: EVIDENCE


Accuracy of multidetector computed tomographic angiography for detecting hepatic artery complications after liver transplantation.

Kayahan Ulu EM, Coskun M, Ozbek O, Tutar NU, Ozturk A, Aytekin C, Haberal M.


Multidetector row CT of various hepatic artery complications after living donor liver transplantation.

Kim SY, Kim KW, Kim MJ, Shin YM, Lee MG, Lee SG.


Three-dimensional gadolinium-enhanced MR angiography of vascular complications after liver transplantation.

Glockner JF, Forauer AR, Solomon H, Varma CR, Perman WH.


Stafford-Johnson DB, Hamilton BH, Dong Q, Cho KJ, Turcotte JG, Fontana RJ, Prince MR.
EVIDENCE: DOPPLER

Prospective evaluation of CE-US and Doppler in the diagnosis of conventional and microvascular hepatic artery thrombosis.

Role of contrast-enhanced US in the diagnosis and treatment of hepatic artery thrombosis.

Implantable Continuous Doppler Transducer for Detection of Hepatic Artery Thrombosis After Liver Transplantation: comparison of conventional and microvascular Doppler.
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VASCULAR IMAGING IN RENAL TRANSPLANTATION
RENAL TRANSPLANTATION

- Extraperitoneal in the right lower quadrant
- **Artery**: end-to-side anastamosis with the external iliac artery
- **Vein**: end-to-side anastamosis with the external iliac vein
- **Ureter**: ureteroneocystostomy
- Urologic complications ~4-8%
- Vascular complications ~1-2%
HEMATOMA

- Common in the post operative period
- Also can develop post biopsy or trauma
- Usually resolve spontaneously and are treated conservatively
Renal Infarct: Accessory renal artery was ligated during the transplant.
RENAL ARTERY THROMBOSIS

- Total renal artery thrombosis rare
- Usually in the early postoperative period
  - m/c/c hyperacute or early acute rejection, surgical technique, atherosclerotic embolism.
- Usually results in loss of allograft
RENAL ARTERY STENOSIS

- Increased incidence with Bladder Augmentation
- Doppler U/S First Line
- Tardus et Parvus
ELEVATED VELOCITY IN THE MRA

Comparison of non-breath-hold high resolution gadolinium-enhanced MRA with digital subtraction angiography in the evaluation on allograft renal artery stenosis.

Chan YL, Leung CB, Yu SC, Yeung DK, Li PK.

• **DDX:**
  - Renal Artery stenosis
  - Kinking/tortuosity of the vessel
  - Often elevated in the early post operative period due to edema at the anastamosis
  - If associated with a tardus-parvus waveform or if clinical concern, should perform an MRA
Percutaneous transluminal angioplasty as first-line treatment of transplant renal artery stenosis.

RENAL VEIN THROMBOSIS

- 0.4-4% Allografts
- Often early complication
  - Surgical technique
  - Hypovolemia
  - RV compression
  - Iliac vein thrombosis
- Doppler:
  - Reversal of flow in MRA
  - Transplant kidney is normally a low resistance organ
  - Reversed diastolic flow indicates high intrarenal vascular resistance
- Often direct to OR

Yang, Nephron, 1996
AV FISTULA

- AV Fistula: Laceration of both artery and vein with communication
- Pseudoaneurysm: Laceration of artery only
- Common, 1-18% post biopsy
- Most resolve spontaneously
AVF with Massive Hematuria
WORST CASE SCENARIO
VASCULAR COMPLICATIONS

- OLT: 9-12%
- CRT: 1-2%
- Early diagnosis and intervention may improve mortality and graft salvage
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